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A MICRO FICHE APPENDIX

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UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))	Attorney Docket No.	RCI001V1
	First Inventor or Application Identifier	CHRISTIAN S. RODE
	Title	APPARATUS FOR EVALUATING AND DEMONSTRATING
	Express Mail Label No.	EJ 17228244505

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
1. <input checked="" type="checkbox"/> * Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)	5. <input checked="" type="checkbox"/> Microfiche Computer Program (Appendix)
2. <input checked="" type="checkbox"/> Specification [Total Pages 13] (preferred arrangement set forth below) <ul style="list-style-type: none">- Descriptive title of the Invention- Cross References to Related Applications- Statement Regarding Fed sponsored R & D- Reference to Microfiche Appendix- Background of the Invention- Brief Summary of the Invention- Brief Description of the Drawings (if filed)- Detailed Description- Claim(s)- Abstract of the Disclosure	6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) <ul style="list-style-type: none">a. <input type="checkbox"/> Computer Readable Copyb. <input type="checkbox"/> Paper Copy (identical to computer copy)c. <input type="checkbox"/> Statement verifying identity of above copies
3. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 25]	ACCOMPANYING APPLICATION PARTS
4. Oath or Declaration [Total Pages] <ul style="list-style-type: none">a. <input checked="" type="checkbox"/> Newly executed (original or copy)b. <input type="checkbox"/> Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 16 completed)<ul style="list-style-type: none">i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).	7. <input type="checkbox"/> Assignment Papers (cover sheet & document(s))
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Prior application information: Examiner Group / Art Unit:

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17. CORRESPONDENCE ADDRESS

☐ Customer Number or Bar Code Label

or ☒ Correspondence address below

(Insert Customer No. or Attach bar code label here)

Name	RODE CONSULTING, INC.				
Address	2412 STEARNS HILL RD.				
City	WALTHAM	State	MA	Zip Code	02451
Country	USA	Telephone	781-999-2290	Fax	REQUEST 781-999-2290

Name (Print/Type)	CHRISTIAN S. RODE	Registration No. (Attorney/Agent)	(PRO SE)
Signature	CHRISTIAN S. RODE	Date	4/6/99

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COPY OF INFORMATION ABOUT SMALL BUSINESS CONCERN

PTO/SB/10 (12-97)

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**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN**

Docket Number (Optional)

Applicant, Patentee, or Identifier: CHRISTIAN S. RODE

Application or Patent No.: _____

Filed or Issued: 4/6/98

Title: APPARATUS FOR ELUCIDATING THE RELATIONSHIP
ELECTRONIC CIRCUITS AND COMPONENTS

I hereby state that I am

- ☒ the owner of the small business concern identified below:
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN RODE CONSULTING, INC.

ADDRESS OF SMALL BUSINESS CONCERN 2412 STEARNS HILL RD / WILMINGTON, MASS
01897

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☒ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

- Each person, concern, or organization having any rights in the invention is listed below:
☒ no such person, concern, or organization exists.
☐ each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF PERSON SIGNING CHRISTIAN S. RODE

TITLE OF PERSON IF OTHER THAN OWNER _____

ADDRESS OF PERSON SIGNING 2412 STEARNS HILL RD / WILMINGTON, MASS 01897

SIGNATURE [Signature] DATE 4/6/98

TITLE OF INVENTION

Patent Application of
Christian S. Rode, U. S. citizen
2412 Stearns Hill Rd.
Waltham, Massachusetts 02451
for
Apparatus For Evaluating And Demonstrating Electronic Circuits And Components

CROSS REFERENCE TO RELATED APPLICATIONS

Not Applicable

(Provisional Application Filing: 60 / 080,905 Filing date: 4/06/98)

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO A MICROFICHE APPENDIX

A source code listing consisting of 1 microfiche and a total of 94 frames is attached.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of computer networks and more specifically to the fields of computer networks and computer simulation.

2. Description of Prior Art

Computer programs for simulation of linear and nonlinear models have long been used to predict or evaluate the behavior of physical systems and components. These programs have also been used to educate students about linear and nonlinear system design. And these programs have previously been used in conjunction with networks (including the Internet) by means of remote terminals or display servers such as X Window.

The use of simulation programs by means of terminals or display servers has typically required a "logon account" and associated password to be created and administered for each user desiring to use the simulation software. Alternatively, guest accounts can be created for which all users share a common storage area and privileges. Both of these methods have limited applicability to public networks, such as the Internet, because

1. Individual logon accounts require time and expense to establish and maintain.
2. Individual logon accounts are not anonymous.
3. Anonymous accounts typically provide only a common storage area where one user's data are at the mercy of other users.
4. Logon accounts are inherently more difficult to make secure than access to a "web server".
5. The display of graphics typically requires the installation of a program such as an X Window server, with associated purchase, storage and maintenance costs.
6. Terminal and display server programs typically will not work across Firewalls without the installation of a special Proxy Server, with associated purchase, storage and maintenance costs.
7. Typical simulation programs do not log their usage.
8. The HTTP protocol and built-in functions of "web browsers" and "web servers" provide no support for resource management of a public CAD tool.

The following books / documents provide relevant background and are incorporated by reference:

"CGI Programming on the World Wide Web", Shishir Gundavaram, © 1996 O'Reilly & Associates, Inc.

"The Essential Client/Server Survival Guide, Second Edition", Orfali, Harkey and Edwards, © 1996 John Wiley and Sons

"Programming Perl", Larry Wall & Randal L Schwartz, © 1991 O'Reilly & Associates, Inc.

"Java in a Nutshell, A Desktop Quick Reference for Java Programmers", David Flanagan, © 1996 O'Reilly & Associates, Inc.

"HTML: The Definitive Guide", Musciano & Kennedy, © 1996 O'Reilly & Associates, Inc.

"JavaScript: The Definitive Guide, 2nd edition", David Flanagan, © 1996-7 O'Reilly & Associates, Inc.

RFC 1945 (HTTP 1.0) / 2048 (HTTP 1.1) / etc., IETF (Internet Engineering Task Force)

RFC 1866 (HTML 2.0), IETF

HTML 3.2, W3C (World-Wide Web Consortium)

As used in this document, the following words with capitalized first letters have special meanings:

A Computer includes any number and organization (cluster, array, etc.) of CPUs, memory / storage / communication devices, etc. and whose function includes the processing of data.

A Client is a Computer that is capable of accepting input from and providing output to an operator. A Client may also be a Server.

A Server is a Computer that provides computational, data storage, communication or other services for at least one (and usually more than one) Client. A Server may also be a Client.

A User is an individual or process that uses a Client. One Client can have multiple Users.

A Network includes all proxy servers, gateways, routers, communication channels, cabling, etc. that comprise a communication medium between two Computers, such as a private, local network or a public network such as the internet.

A Unique Identifier is a token (a collection of letters, digits and other symbols) that with high probability (>99%) is uniquely associated with a single User. For example, a uniformly-chosen 64-bit random number is considered a Unique Identifier for the purposes of this definition, because the probability is very small (<1%) that two users could be assigned the same number. A Unique Identifier does not necessarily contain or point to personal information about the user, i.e., an anonymous user can be assigned a Unique Identifier.

A Browser is a Client program that at least a) accepts data in the form of a display list (e.g. HTML, XML) and b) wherein at least one of the interpretable display list elements is a "hyperlink" having the capability to "link" to display list data on Servers other than (and in addition to) that which provide the list containing the link. c) uses an intrinsically stateless, file-oriented protocol (e.g. HTTP) to retrieve objects named in the display list (e.g. GIF, JPG). Typical Browsers have many other capabilities in addition to these. The words "link" and "hyperlink" are standard terms of art within the field of HTML, HTTP and the WWW.

Form Structure Data are those elements of a fetched Browser display list (e.g. <FORM> tag and associated elements) that create corresponding form elements in which data can be entered and submitted to a Server (such submitted data is Form Data)

BRIEF SUMMARY OF THE INVENTION

The growing availability of HTTP-compatible software such as "web browsers" and Java™ makes desirable the use of the HTTP protocol as the basis for new simulation methods and apparatus.

It is therefore an object of the present invention to provide methods that enable 1) the serving of (optionally customized) Form Structure Data (in HTML, Java, etc.) to a Client, 2) the combination of Client-submitted data from said form with template or other data, 3) the processing of the combined data via a program such as SPICE and 4) the conversion and return of any processed output data to a client computer. Any and all of these steps will be referred to as simulation services.

It is another object of the present invention to provide methods that make simulation services available to an arbitrary number of simultaneous users by generating and using a Unique Identifier to keep user data separate and inhibit users from accessing each other's data.

It is yet another object of the present invention to provide methods that restrict the availability of simulation services by assigning verifiable (i.e., difficult to forge) Unique Identifiers. Such identifiers may be valid for only a limited time, in order to inhibit sharing, publishing, etc. of valid identifiers.

It is yet another object of the present invention to provide methods that limit use of simulation services to those submitted from a page created or retrieved from a particular server.

It is another object of the present invention to provide a plurality of output modes so as to be compatible with a variety of web browsers.

It is yet another object of the present invention to limit the computational resources used by any user on a per-simulation and per-time (such as day, week, month, etc.) basis.

It is yet another object of the present invention to log client submissions for marketing research, debugging, or other purposes. The log may use just the Unique Identifier and keep detailed client information in a separate file or database.

BRIEF DESCRIPTION OF THE DRAWINGS

- Fig. 1 A minimal system configuration consisting of 1 or more Clients, 1 combination web / simulation Server plus a Network.
- Fig. 2 Minimum Standard configuration: 1 or more Clients, 1 (or more) web Server(s), 1 simulation Server, plus Network Means
- Fig. 3-A High Performance Configuration (Method 1): 1 or more Clients, 1 (or more) web Server(s), more than 1 simulation Servers, plus Network Means. Simulation data submitted directly to simulation server.
- Fig. 3-B High Performance Configuration (Method 2): Same hardware as in 3-A, form data submitted to web server which forwards client to simulation server.
- Fig. 3-C High Performance Configuration (Method 3: Proxy service): Same hardware as in 3-A and 3-B, form data is submitted to web server which forwards the data to a simulation server and returns any output to client.
- Fig. 4-A Sample User Interface: Example login (HTML input form)
- Fig. 4-B Sample User1 Interface: Select Circuit Topology (HTML input form)
- Fig. 4-C Sample User Interface: Edit Component Values (HTML input form)
- Fig. 4-D Sample User Interface: Edit Additional Component Values (HTML input form)
- Fig. 4-E Sample User Interface: Simulation in Progress (HTML)

- Fig. 4-F Sample User Interface: Simulation Results #1, Transient Output Plot (HTML + dynamically generated GIF plot)
- Fig. 4-G Sample User Interface: Submit Simulation #2 (HTML input form)
- Fig. 4-H Sample User Interface: Simulation Results #2, Frequency Output Plot (dynamically generated Adobe Acrobat PDF plot)
- Fig. 4-I Sample User Interface: Submit Simulation #3 (HTML input form)
- Fig. 4-J Sample User Interface: Simulation Results #3, Impedance Output Plot (dynamically generated Java plot)
- Fig. 4-K Sample User Interface: Disabling individual traces in a Java Plot
- Fig. 4-L Sample User Interface: Select Circuit Topology (Java input)
- Fig. 5-A Sample User Interface: Calculator assistant for HTML interface (HTML input)
- Fig. 5-B Sample User Interface: Calculator assistant for Java interface (Java input)
- Fig. 6-A User Interface: Circuit Synthesis, Startup (Java input)
- Fig. 6-B User Interface: Circuit Synthesis, Selecting synthesis function (Java input)
- Fig. 6-C User Interface: Circuit Synthesis, Selecting Performance Targets (Java input)
- Fig. 6-D User Interface: Circuit Synthesis, Synthesized Circuit Output / Edit Component Values (Java output / Java input)
- Fig. 6-E User Interface: Circuit Synthesis, Simulation Output (dynamically generated GIF output, reduced)
- Fig. 6-F User Interface: Circuit Synthesis, Simulation Output (dynamically generated GIF output, 100%)

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The goal was to design a simple system capable of evaluating and comparing components and circuits (connected components) for the purposes of sales, marketing, educational and technical support, accessible world-wide. In all scenarios a primary advantage of the invention is to make such evaluations and comparison easier and faster, relative to the prior art. Previously, detailed component evaluation typically involved downloading and installing models and programs, with attendant risk and inconvenience to a (prospective) customer or student. The current invention also extends the advantages of a client-server implementation with respect to unburdening client computer resources (computational, storage, etc.) to anonymous users on the world-wide web (WWW) / public internet.

A secondary goal was to give unsupervised users access to simulation tools utilizing proprietary engineering data (for example, SPICE models) without giving access to the proprietary data itself. For example, the current state of the art is to distribute either 1) SPICE “macro” models (i.e. simplified models) of limited accuracy or 2) to distribute very detailed models (often under non-disclosure agreements) to customers who may be able to use the greater detail to discover proprietary design information. The current invention makes it possible to allow users to simulate real circuits with the most detailed models over the internet while keeping some model data hidden.

The preferred embodiments use HTML or Java (or both) and HTTP / CGI to create public internet / WWW interfaces to the simulation tools. There are significant technological differences between a Browser CAD tool interface and client-server CAD implementations that have come before. These differences and the requirements of public access require additional innovations to accomplish the goal as set forth above.

Some of these differences include: 1) the need to synthesize a Unique Identifier to create user state, separate user data and manage user resource use 2) preventing or automatically detecting and compensating for abuse; limiting access; load management and reporting 3) usage logging for marketing or quality control purposes, 4) the variable capabilities and compatibilities of browsers.

1. Description

Three topologies and five distinct systems are illustrated in Fig. 1- Fig. 3C. All consist of Client(s), Server(s), a connecting network and new Server methods. The distinctions among them are the number and types of Servers and the methods used therein. In the preferred embodiments these methods are implemented as Apache Unix (Linux) CGI-scripts, predominantly written in Perl. Other languages and operating systems are contemplated, for example, Java servlets running within Microsoft's Internet Information Server. In all cases, the connection network (200) is undefined and may include an unknown number of proxy servers, gateways, routers, communications channels, cabling and the like. An example, however, would be the public internet / WWW.

At least some of following known methods are distributed among the different kinds of Servers:

- a) HTTP GET, POST, etc. and CGI methods (standard web server methods)
- b) Methods for restricting access to a web site by a particular IP address, domain or sub-domain.

At least some of the following new methods are distributed among the different kinds of Servers:

- a) A Unique Identifier assignment method.
- b) An optional Unique Identifier validation method.
- c) A form structure data generation method. This may include merging the Unique Identifier into a template form.
- d) A form structure data and circuit synthesis method. A schematic with a corresponding component form is synthesized for user input and according to user specifications.
- e) A method for merging submitted form data with other data in preparation for processing.
- f) Processing merged data to produce output data compatible with a Browser. This is possibly divided into the sub-methods of creating temporary output data, then converting said data to a Browser-usable format.

- g) Methods for limiting the number of simulations per Unique Identifier, per day (or other unit of time)
- h) Methods for canceling simulations in progress in favor of new submissions submitted by the same user (as identified by the unique identifier)
- i) Optional methods for gradually reducing the priority of successive jobs submitted by the same user.

2. Operation

In the preferred embodiments the Server methods are based on standard HTTP / CGI protocols and consequently many of the error or other unusual conditions handled by those protocols are not shown, only a typical transaction is illustrated.

In Fig. 2, the “minimum standard” Client-Server arrangement is shown: one or more Clients (100), one “standard” or “ordinary” web Server (400) and one web-based simulation Server (500). In this preferred embodiment both of these Servers have a web server, (e.g. Apache) running on each and new methods are implemented using CGI scripts. In this configuration, the Client requests HTML, image and other web data, including “form structure data” (data that comprises a list of form elements), from the standard web server, much as is the typical case for most servers on the WWW. Form structure data pertaining to simulation, however, is so constructed as to refer to the simulation Server. When the user submits data from these forms, the action is completed by the simulation Server, rather than the standard Server. This is done so as to unburden the standard Server of the computationally intense task of simulation.

In Fig. 1, the standard and simulation servers are combined into a single server, of lower cost and performance (300).

In Fig. 3A, a higher performance system is envisaged in which multiple simulation servers are available to provide a corresponding multiplication in the number of simultaneous simulations that can be processed. (The alternative of a single, multiple CPU server is considered to fall under either Fig. 1 or Fig. 2). In this case the simulation server is chosen ahead of time by the standard Server, by an unspecified algorithm, such as round-robin allocation. The server to be used is dynamically encoded in the form structure data that is sent to the client.

In Fig. 3B, a system similar to 3A is used except that the standard Server directs all simulation form submissions to itself then redirects those submissions (e.g. using the Location: directive) to one of the simulations Servers, by an unspecified algorithm.

In Fig. 3C, a similar system to 3B is used except that the standard Server directs all simulation form submissions to itself and then makes a request of at least one of the simulation servers, the response(s) to which it returns to the Client. In this configuration it is not necessary for the communication between the standard Server and the

simulation Server(s) to be HTTP / CGI and the standard Server is a kind of proxy server / gateway. Any high-performance protocol is sufficient since the Client interface is solely with the standard Server.

Figs. 4A-L show a typical Client presentation, to be used in conjunction with Fig. 2 to explain a typical simulation session.

In generating a Unique ID, it is desirable to make the creation of the ID somewhat burdensome so that replacing exhausted IDs is non-trivial. This can be accomplished by means of a ID creation screen (as shown in 4A, a login screen) which may involve the entering of subscription data, taking a survey or simply filling out a make-work form. In the preferred embodiment the ID can be inserted into the URL so that it becomes part of PATH-INFO and preserved in a cookie (HTTP / CGI terms of art). The cookie / path-info mechanism are well known.

After the ID has been generated the user's Browser is forwarded to a simulation page. As shown here, the first CGI script executing is called "get" which treats everything after "get" in the URL as PATH-INFO. The first piece of the PATH-INFO is the number 891835080547, which in this particular case is the Unique ID. At time of creation, the Unique ID is also sent as a cookie, so that if the Browser is cookie-capable the ID will be remembered automatically when the user visits the page in 4A again and they will be forwarded automatically to this page. The rest of the path-info is used to fetch other web data, in this case a Perl script.

In Fig. 4C, the user has decided to select a different circuit to simulate and is entering data into a(n HTML) form element. Fig. 4D shows some of the other options possible in this form. In 4E they have clicked the "Simulate" form submission button and a new page has popped up with a temporary message (in Netscape browsers only) that says "Simulation in Progress". In the "Fig. 2" preferred embodiment, the clicking of the "Simulate" button sent form data directly to a simulation Server as designated in the ACTION field of the <FORM> tag. The following steps are performed at this time by the simulation server.

- a) The Unique ID is retrieved and checked to make sure it is authentic. If not the user Browser is directed to an error page.
- b) If authentic, the Unique ID is looked up in a database (in the source listing, this is simply a text file)

to determine which account directory should be used. A simulation counter and timestamp are also retrieved and it is determined whether too many simulations have been run by this ID within the prescribed time. If too many have been run, the user Browser is directed to an error page.

- c) A check is run to find existing processes running with this Unique Identifier. This may involve either a “process ID” temporary file or a search of a system process list or both. If any processes are found, they are aborted (killed).
- d) The user-submitted form data is merged with a template file and the result is submitted to a simulation program such as SPICE. In some cases, the output data must be further converted to a standard format such as GIF or PDF before return. Several temporary files are typically created that use the Unique ID in their names to guarantee they don’t conflict with the temporary files of other users. Part of the submitted form data determines the output format and thus the present invention includes multiple user-selected output modes for maximum Browser compatibility.
- e) If the simulation is successful, the output data is returned to the user Browser (by using web server methods. If it is not successful an error page is shown.

In Fig. 4F a successful transient simulation is shown with the output as a 1024x1024 pixel GIF plot shrunk into a 512x512 area. By clicking on the GIF image, the entire 1024x1024 plot is displayed. Figs. 4G and 4H show the simulation process repeated for a frequency plot in Adobe™ Acrobat™ PDF™ format. Figs. 4I and 4J show the process repeated for a Smith chart impedance plot with the output a Java applet page that draws a display list. A URL reference to a display list is incorporated in the <PARAM>s to the Java applet is separately fetched from the simulation Server and rendered. Fig. 4K shows the ability of this Java applet to show or hide waveforms.

Fig. 4L shows that the HTML interface can be reproduced (and extended) by using Java. Moreover, the HTTP methods used by the simulation servers are available to Java, so the new Server methods are usable by both HTTP and Java interfaces, simultaneously. In this case, however, it’s important to note the value of the Unique ID being available in both the PATH-INFO and a cookie, since it is believed to have been experimentally shown that a) Java applets should be given IP addresses for their CODEBASE parameter, so as to avoid a Netscape proxy server incompatibility. b) an IP address and corresponding domain name constitute separate “zones” for cookie data and so said data won’t be transmitted for Java submissions to a simulation Server by an IP address.

Fig. 5A and 5B show calculator-type “assistants” or “accessories”. In this case they are transmission line parameter calculators that translate physical geometry into more useful parameters. By means of JavaScript it is possible to calculate derived quantities and set those values automatically in the simulation form. Similarly, it is possible for a Java calculator to find and send messages to a Java simulation interface. Some browsers also have the capability to have JavaScript call Java and vice versa.

In Fig. 6A through 6F is presented a synthesis extension to the new Server methods previously discussed. In Fig. 6A a Java interface is presented. In Fig. 6B the synthesis function is selected (high-pass filter). In 6C other parameters have been selected and the “Calculate” button is about to be pressed. When calculate is pressed, the following steps will take place:

- a) Form data is submitted to a new set of methods (a new CGI script) which synthesize the topology and component values according to the submitted data.
- b) The synthesized topology and component values are converted into schematic graphical data and Form Structure Data. The synthesized Form Structure Data is similar to the generated Form Structure Data of earlier examples, except that said Data contains a new, hidden description of the synthesized circuit, or alternatively a pointer to a temporary circuit template file, synthesized in parallel with the Form Structure Data.
- c) The Form Structure Data is returned to the Client. In this embodiment, the data is displayed in a separate HTML frame of the user’s Browser.

At this point, the user’s options are similar to those earlier when a static circuit was chosen for simulation. Proposed values can be edited and then simulated or directly simulate to confirm correct synthesis. Post synthesis simulation is a powerful tool for checking synthesis accuracy and practicality.

3. Anticipated extensions

The new simulation methods could be implemented as a “plug-in” to a web server or merged completely with web server methods so as to produce a single software entity of higher performance and less costly to install and maintain.

System synthesis methods could be used to front-end multiple circuit synthesizers, each of these circuit synthesizers distinct and yet similar in broad concept to the filter synthesis module demonstrated. Said system synthesis methods could choose the circuits that would compose a system and then automatically call each of the circuit synthesizers in turn while presenting the user with design options.

There may be other uses and extensions not yet envisioned. Although the examples and discussion are based in electronic circuits, simulators such as SPICE are widely used to simulate mechanical, biological, etc. systems and therefore nothing in this application is intended to limit its scope to purely electronic devices or systems.

Thus the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.

CLAIMS

What is claimed is

1. A network of computers comprising at least one Client, said at least one Client including memory means containing instructions for a Browser, and at least one Server communicatively couplable to said at least one Client, said at least one Server including memory means containing instructions for implementing a simulation method, said simulation method comprising the steps of:

- a) Creating and transmitting a Unique Identifier to said at least one Client.
- b) Transmitting Form Structure Data to said at least one Client.
- c) Accepting User Form Data from said at least one Client.
- d) Merging said Form Data from said at least one Client with other data, including template data.
- e) Processing said merged data to produce output data, wherein said output data are functions of a simulation and in a format compatible with said at least one Client Browser instructions.
- f) Transmitting said output data to said at least one Client.

2. The computer network of Claim 1 wherein only steps c-f ~~may~~ ^{have to} be repeated for each new simulation of the same form and wherein only steps b-f ~~may~~ ^{have to} be repeated for each simulation of a new form.

3. The computer network of Claim 2 wherein said output data is rendered by Client Browser methods for visual display.

4. The computer network of Claim 1 wherein said Unique Identifier is used to keep the data of each user separate from all other users, with high probability (>99%).

5. The computer network of Claim 4 wherein said user data is stored in temporary files with a limited lifetime.

6. The computer network of Claim 1 wherein the Unique Identifier is made verifiable by means of an internal checksum.

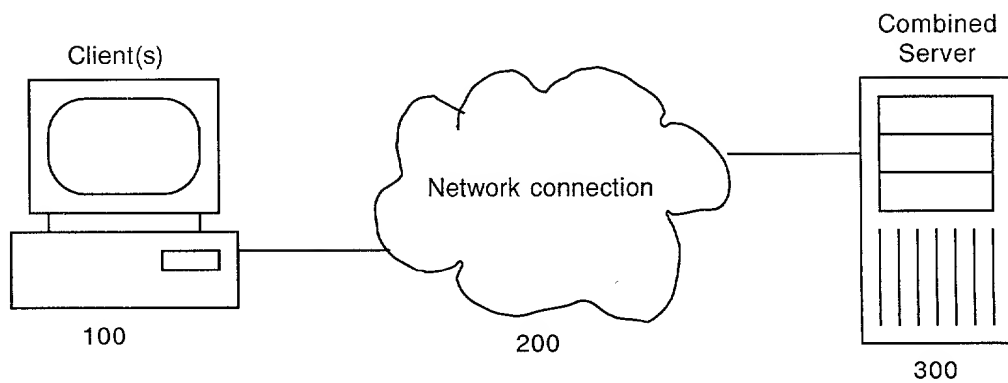
7. The computer network of Claim 6 and further comprising a database of Unique IDs, simulation counts and timestamps stored in at least one Server and further comprising the following additional steps before processing of merged data:

- a) Lookup the Unique Identifier in the database and retrieve the simulation count and timestamp. If no record found, create a new record associated with the Unique Identifier and containing the number of simulations performed (0) and a timestamp.

- b) If said timestamp has become older than a certain threshold, delete said simulation record and return to step a)
 - c) Using said Identifier, number of simulations and timestamp, determine if said number of simulations per unit time has exceeded some threshold.
 - d) Simulate only if the threshold has not been exceeded.
 - e) Update the number of simulations performed.
- 8. The computer network of Claim 7, wherein the simulation count is used to lower the process priority of the simulation.
- 9. The computer network of Claim 1, wherein additional steps related to circuit synthesis are inserted just before step b), such steps comprising
 - aa) Transmitting Circuit Synthesis Form Structure Data to said Client
 - bb) Accepting Circuit Synthesis Form Data from said Client
 - cc) Synthesizing a circuit according to said Form Data.
 - dd) Creating Form Structure Data for use in step b), said Form Structure Data containing circuit topology data.
- 10. A network simulation method, comprising the steps of
 - a) Creating and transmitting a Unique Identifier from a Server to a Client.
 - b) Transmitting Form Structure Data from a Server to said Client.
 - c) Accepting User Form Data into a Server from said Client.
 - d) Merging said Form Data from said Client with other data, including template data.
 - e) Processing said merged data to produce output data, wherein said output data are functions of a simulation and in a format compatible with said Client Browser.
 - f) Transmitting said output data to said Client.

A new system for simulation of electrical circuits and devices over a network is disclosed. The system consists of at least a client computer, a server computer, a network that connects them (including intermediate proxy servers and routers) and software methods. New software methods are disclosed that combine client-submitted data from the internet with template data, simulate the combined data using a simulator such as SPICE and create display and other data for transport to and display on the client computer. Additional methods are disclosed relating to circuit synthesis prior to simulation, access control, limiting resource use and abuse, expiration of temporary files and identifiers and usage logging.

Minimal simulation configuration



- (0) Client user has logged in and obtained a session ID, if necessary
- (1) Form data (HTML or Java) ←
- (2) Form submission (CGI GET or POST) →
- (3) (simulation)
- (4) Results (HTML+GIF, JPG, PNG, etc. or PDF or Java, etc.) ←

Fig. 1



Minimum standard configuration

(0) Client user has logged in and obtained a session ID, if necessary

(1) Form data (HTML or Java). ACTION URL points to Server 2

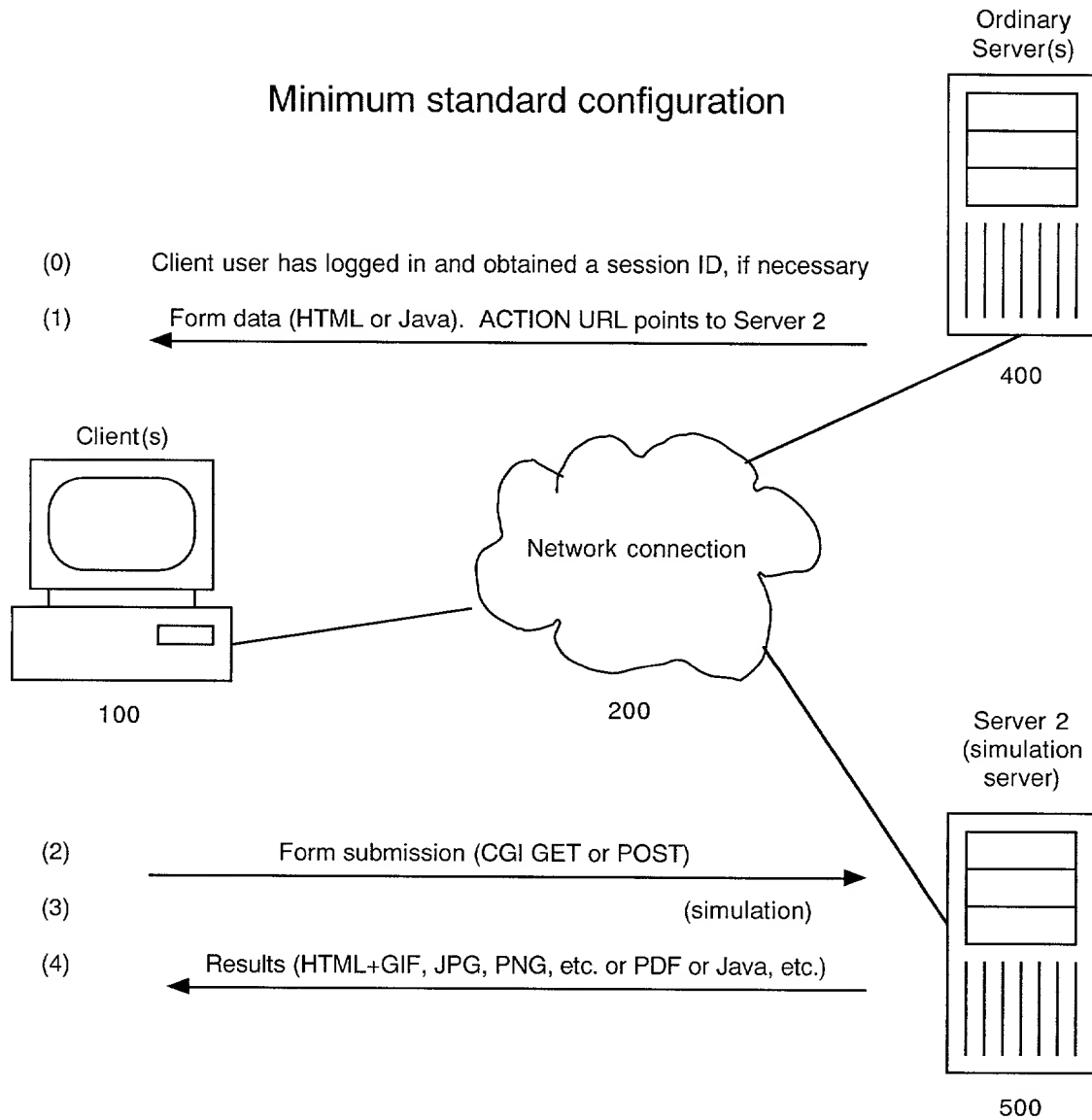


Fig. 2



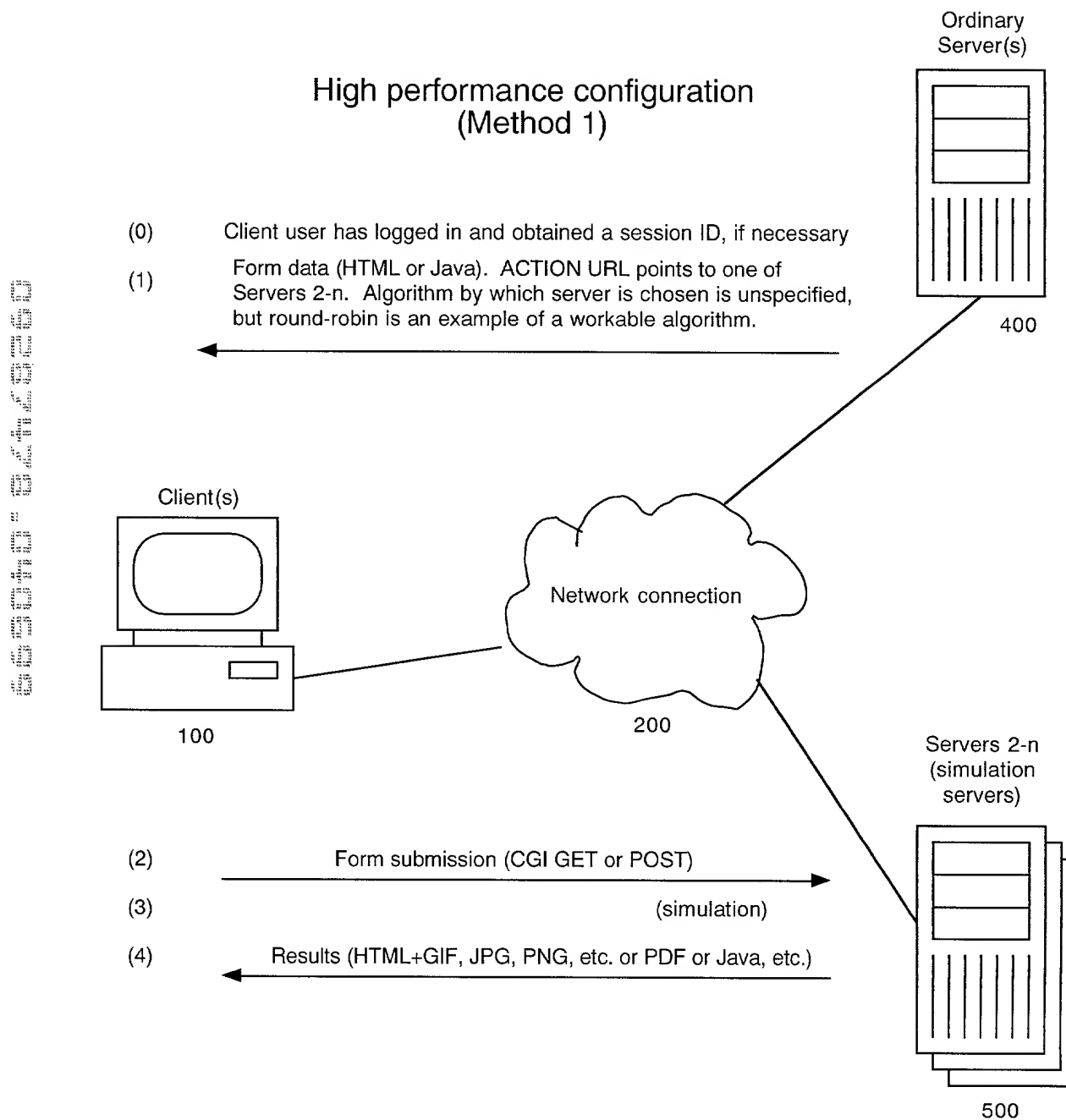


Fig. 3A

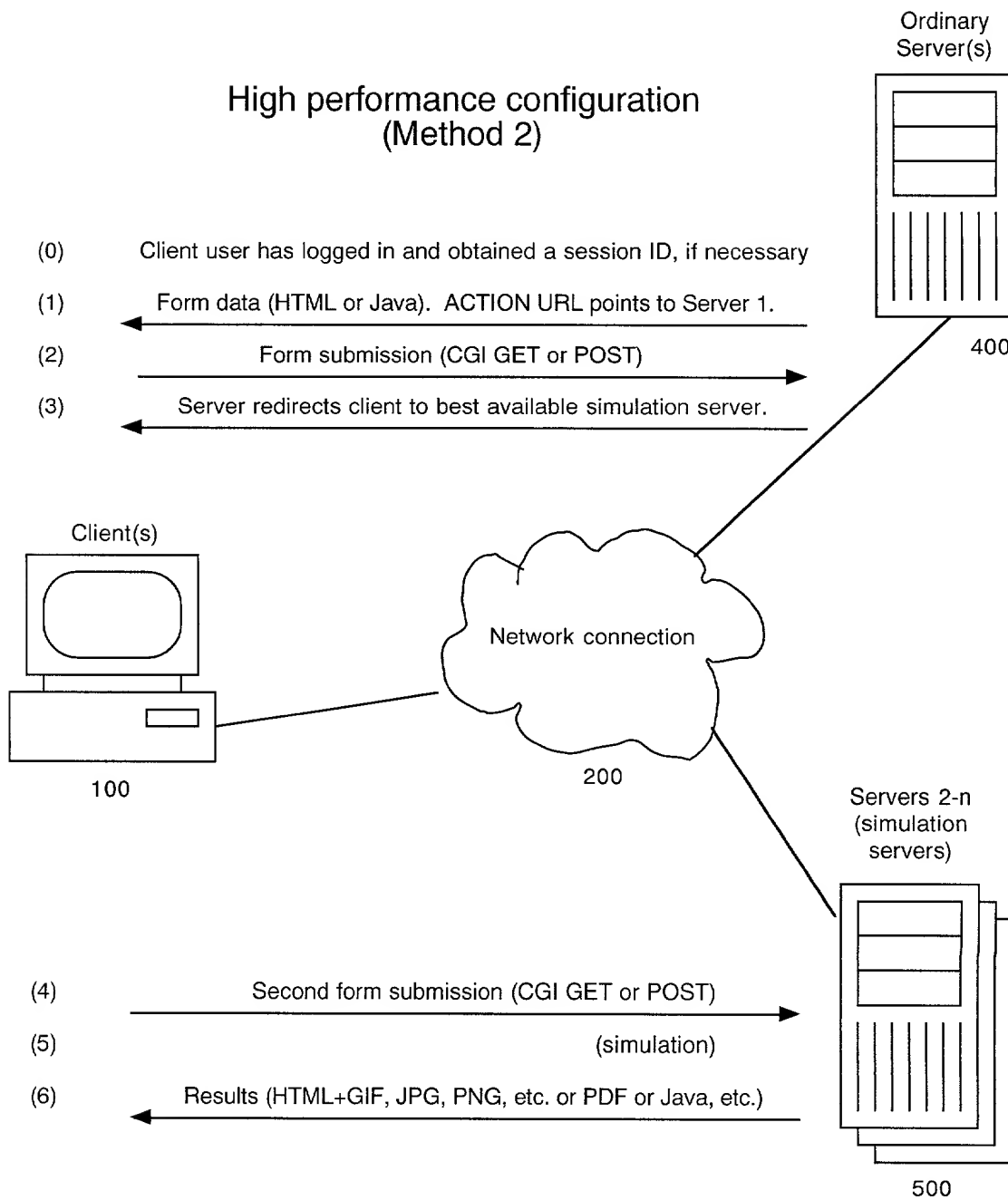


Fig. 3B

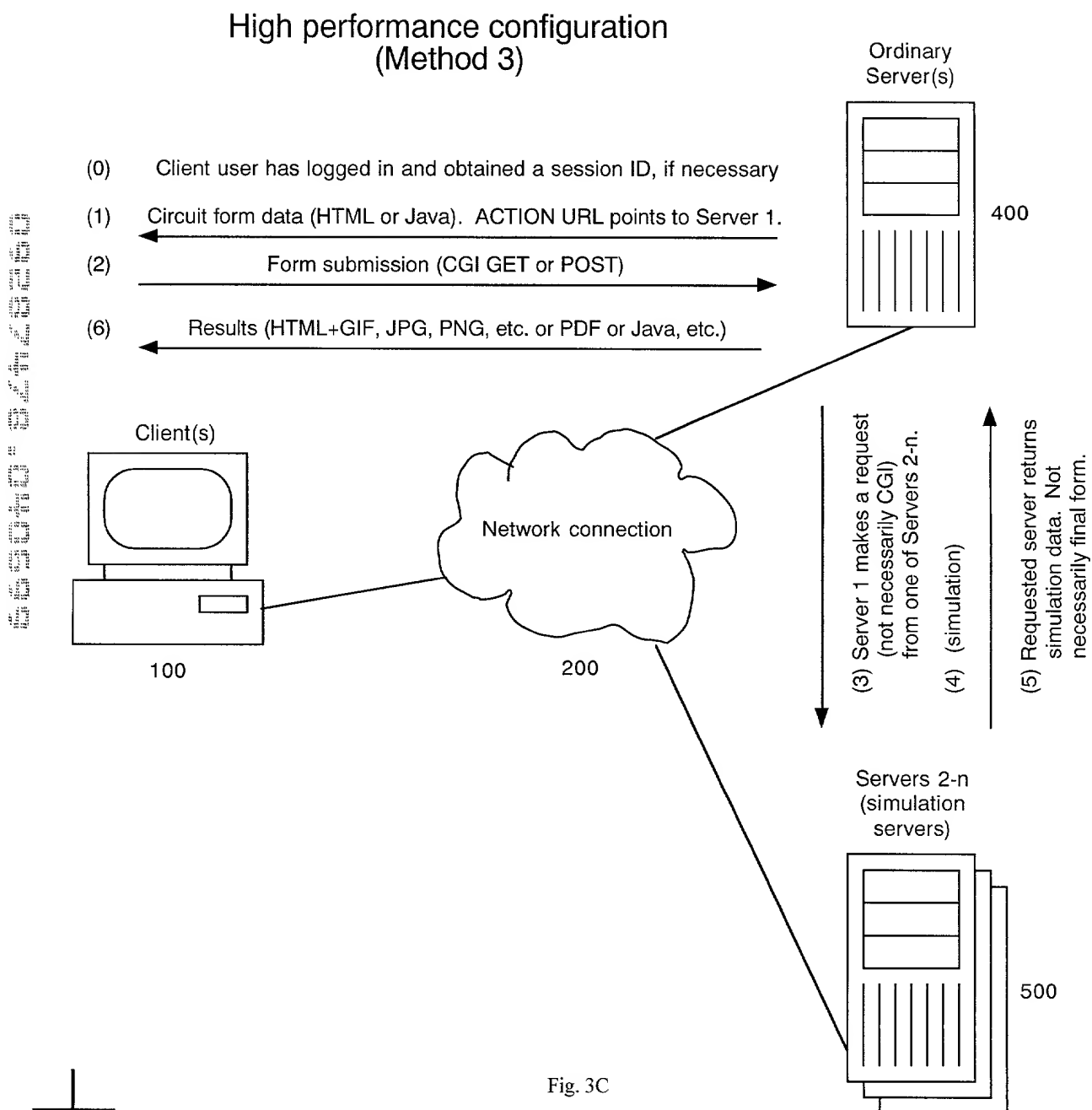


Fig. 3C

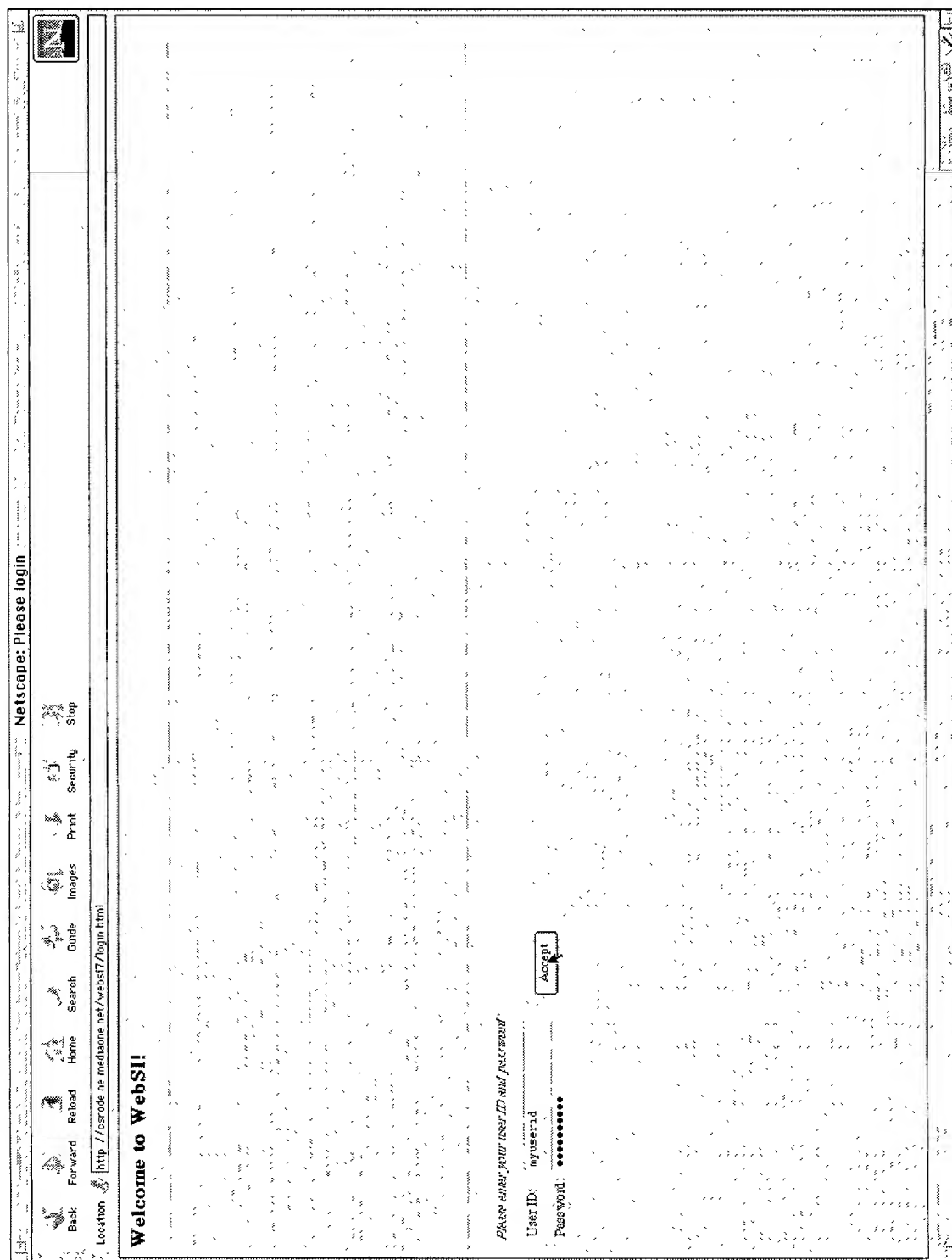


Fig. 4A

Location: <http://csrode.ne.mediaone.net/cgi-bin/webst7/get/891835080547/1/index.pl>

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Netstage: Transmission Line Simulation

Transmission line example #1
Simple transmission line, resistive termination

Resume 1.000 pS Z0 68 ohms Eff 3 2 Step amp. 3 V Polarity Rising

Driver Ideal voltage source

TL length 5 cm R2 68 ohms R3 1e99 ohms

Receiver LC wideband clamp

CL 4 pF Clamp Both

Plot method GIF Plot Transient Simulate

Extra transmission line simulator
Transmission line calculator - vna version

<http://csrode.ne.mediaone.net/cgi-bin/webst7/get/891835080547/1/12.html>

Fig. 4B

Location: <http://cs.ode.ne.mediaone.net/cgi-bin/webst7/get/591825080547/11/12.html>

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NetScape: Transmission Line Simulation

Transmission line example #2

Simple transmission line, capacitive termination.

Rise time 1000 pS
 Step amp 3 V
 Polarity Rising
 Driver Ideal voltage source
 Receiver LC w/induct clamp
 CL 4 pF
 CLAMP Both
 Plot method GTF
 Plot Transient
 Simulate

[Save transmission line simulation](#)
[Transmission line calculator - Java version](#)
[Login](#)

Fig. 4C



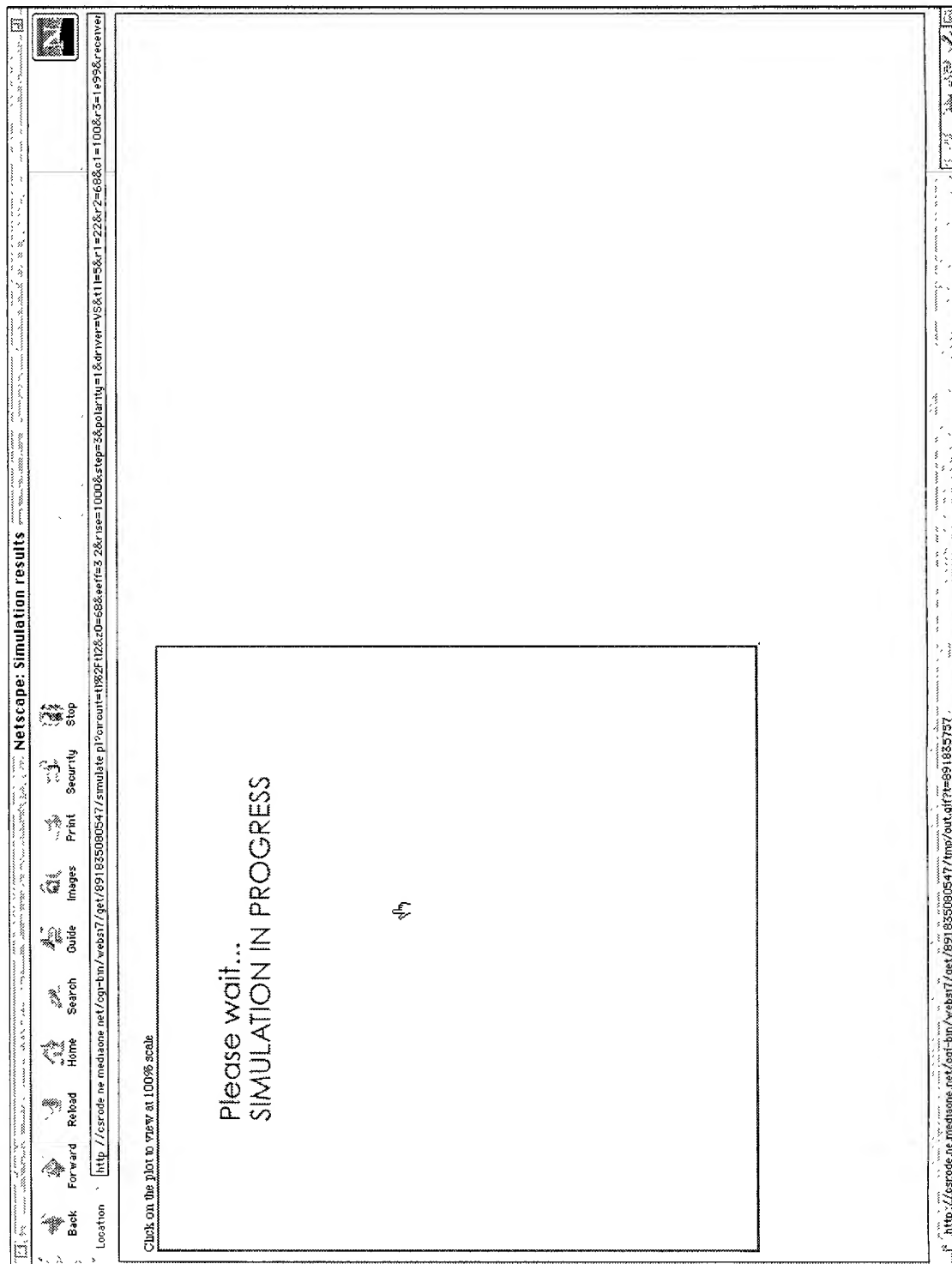


Fig. 4E

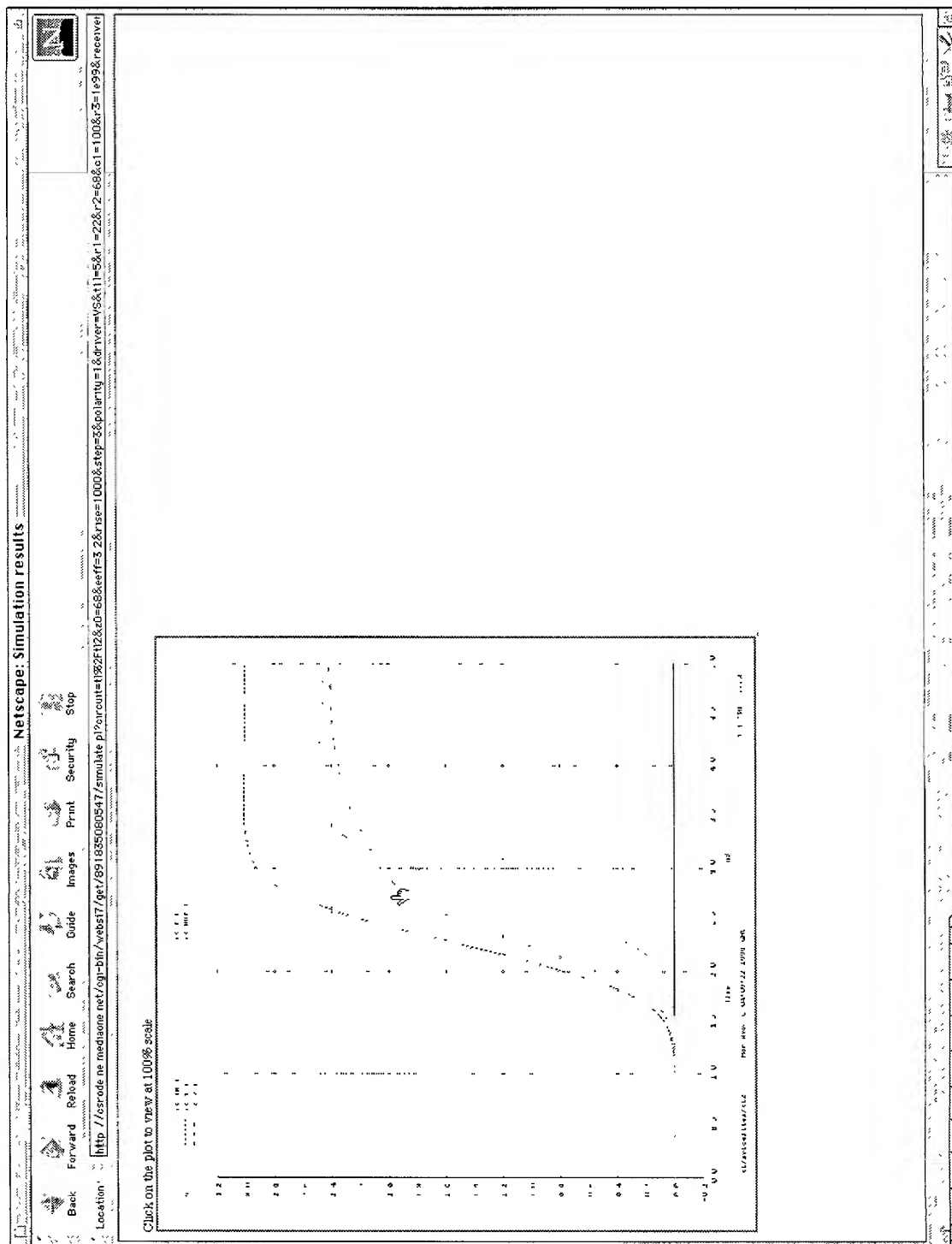


Fig. 4F

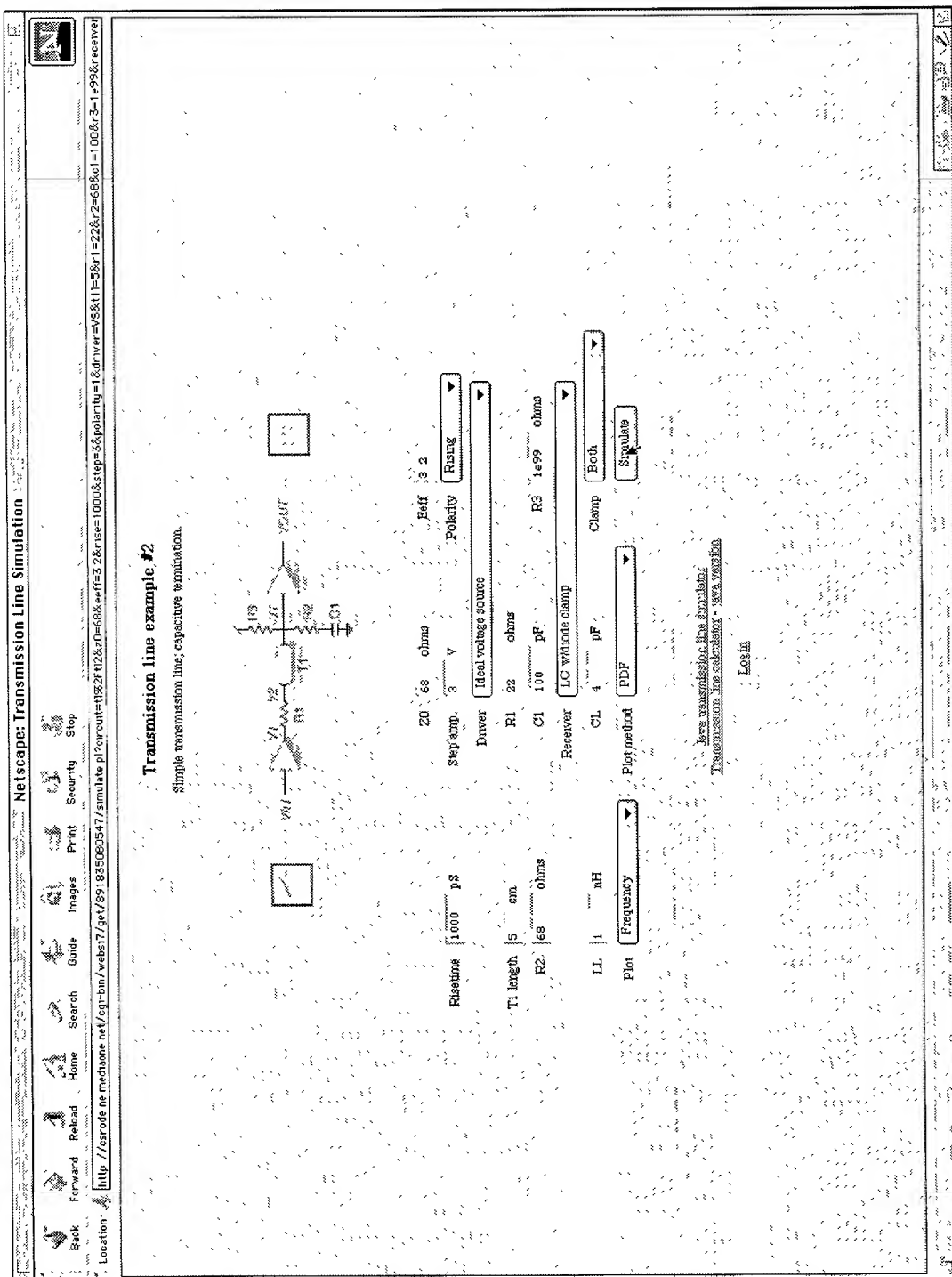


Fig. 4G

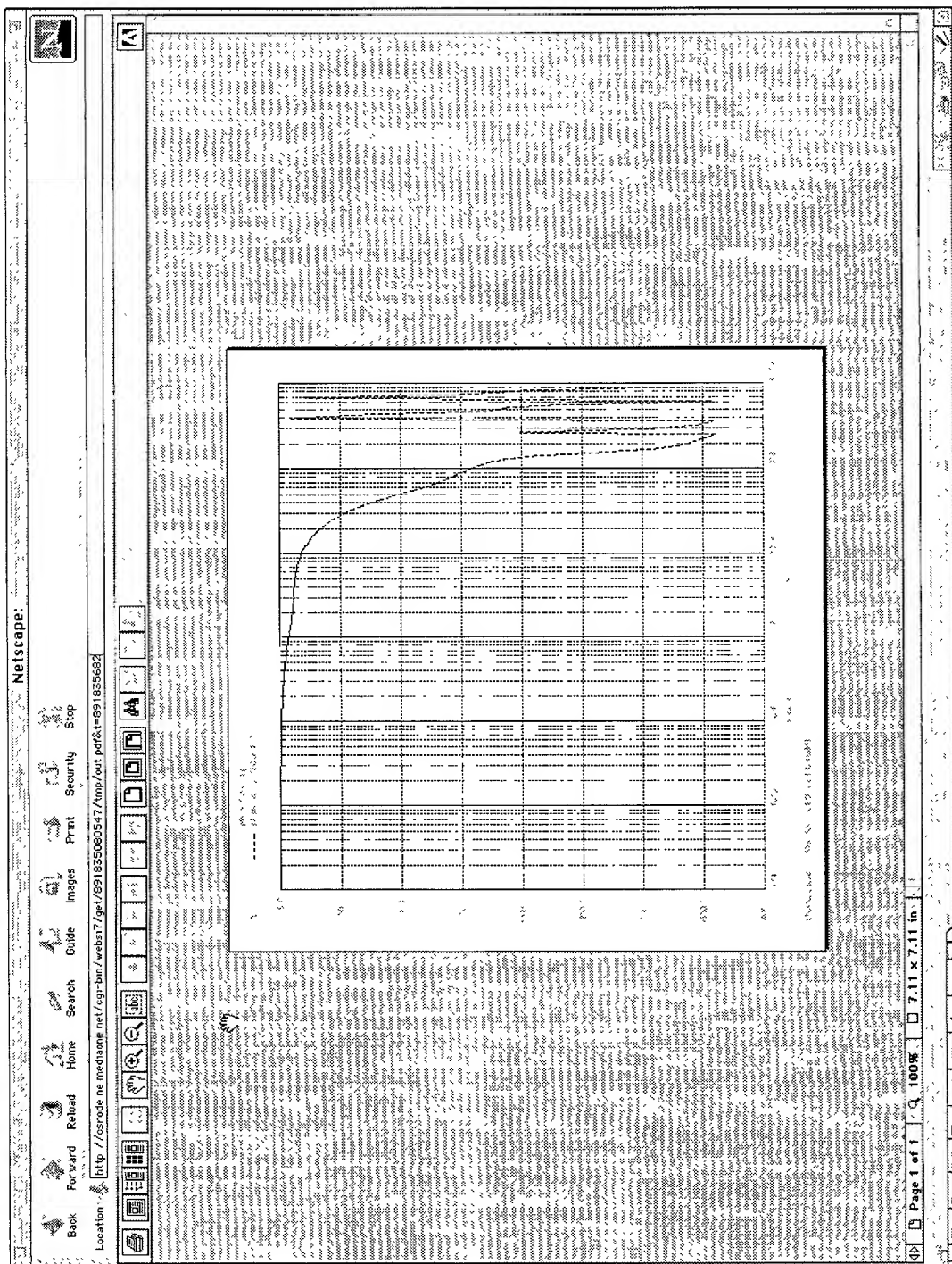


Fig. 4H

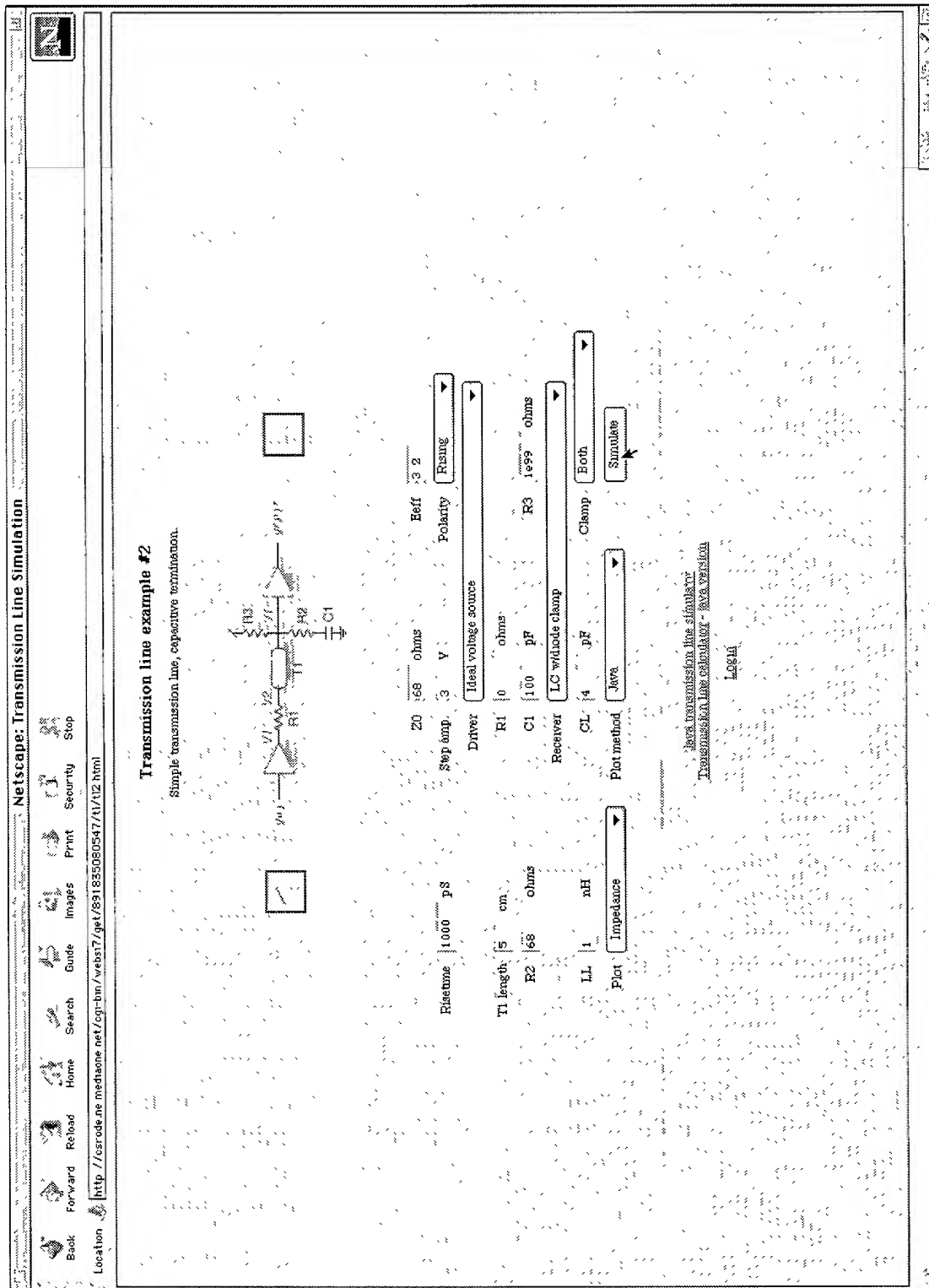


Fig. 41

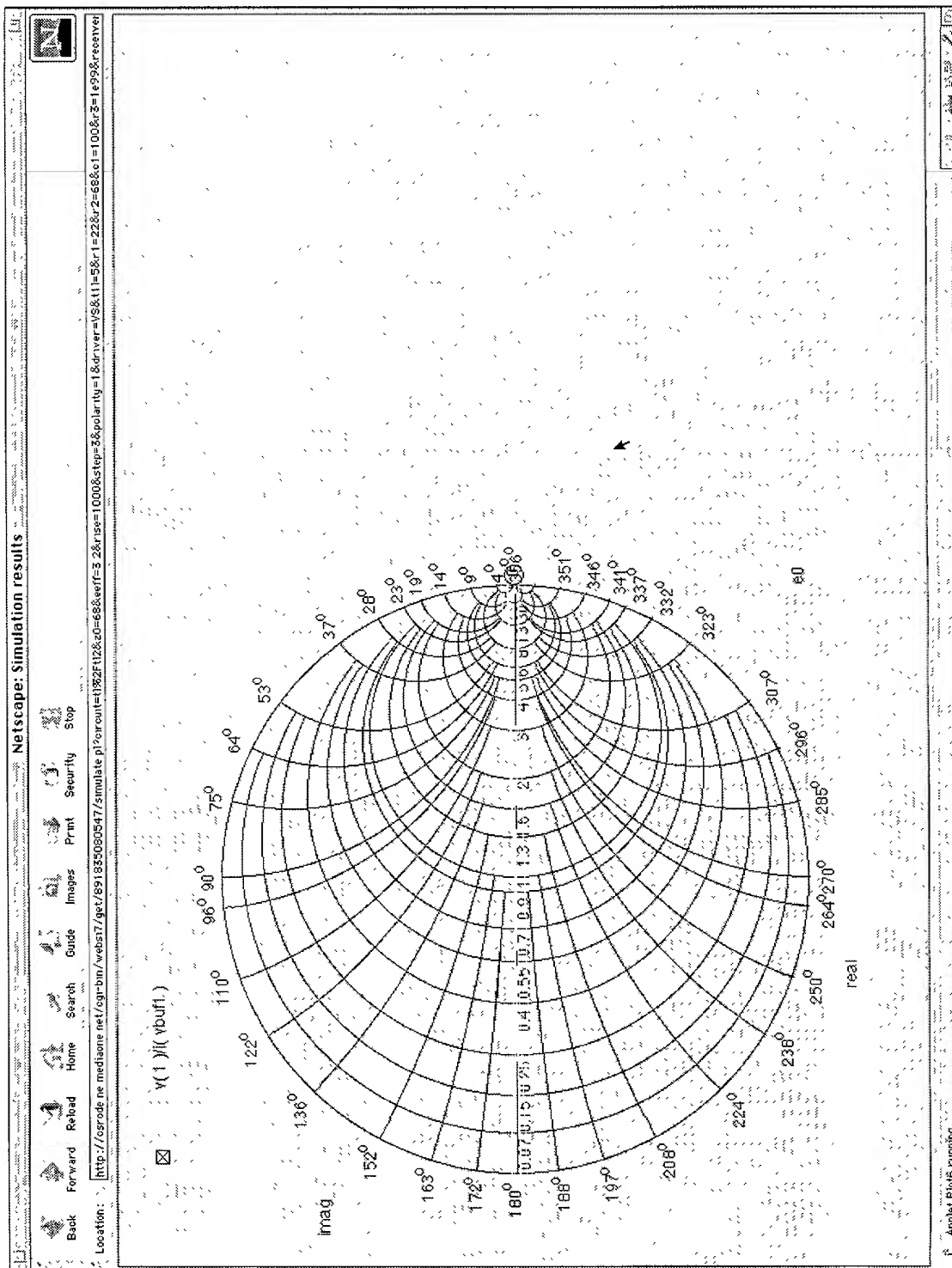


Fig. 4J

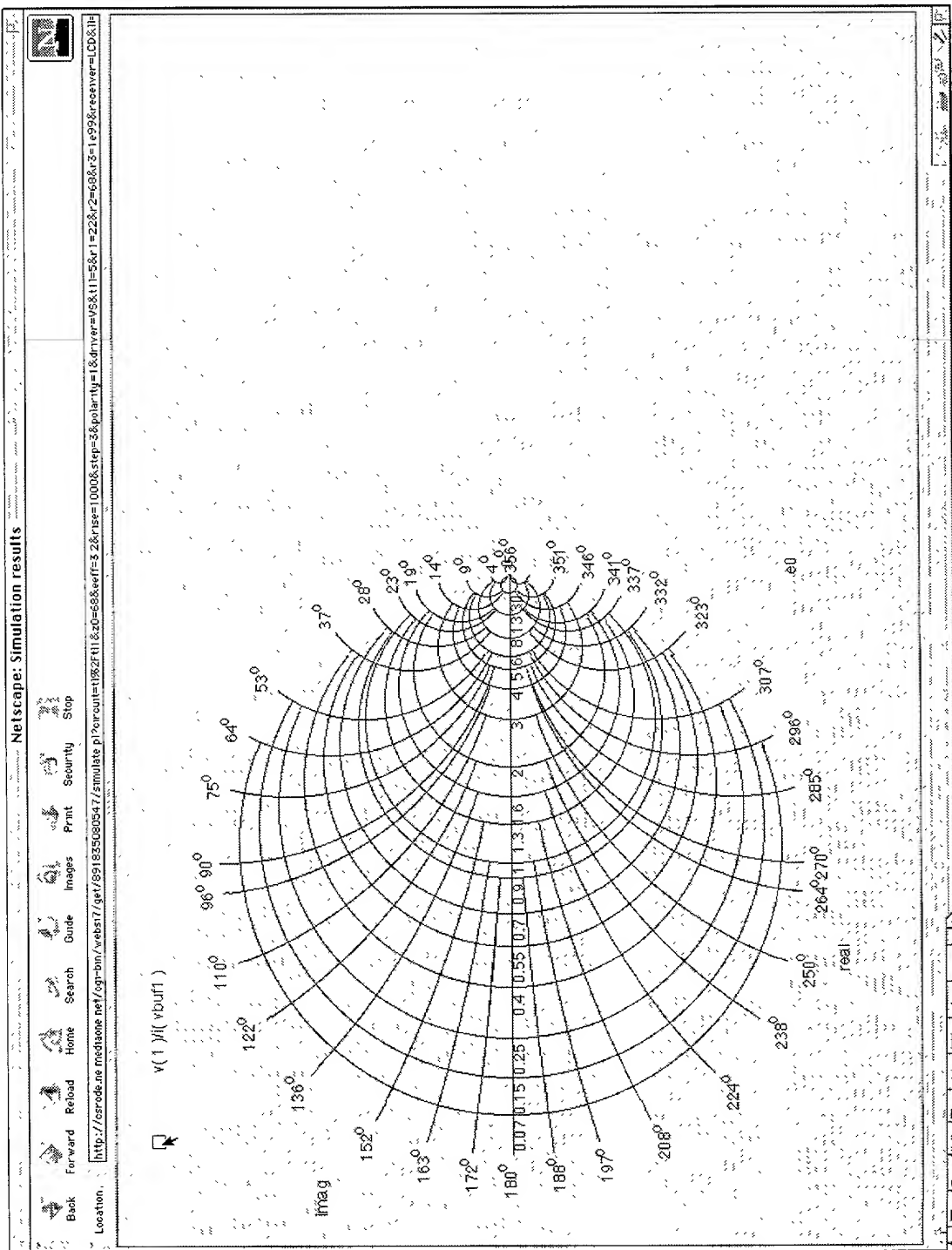


Fig. 4K

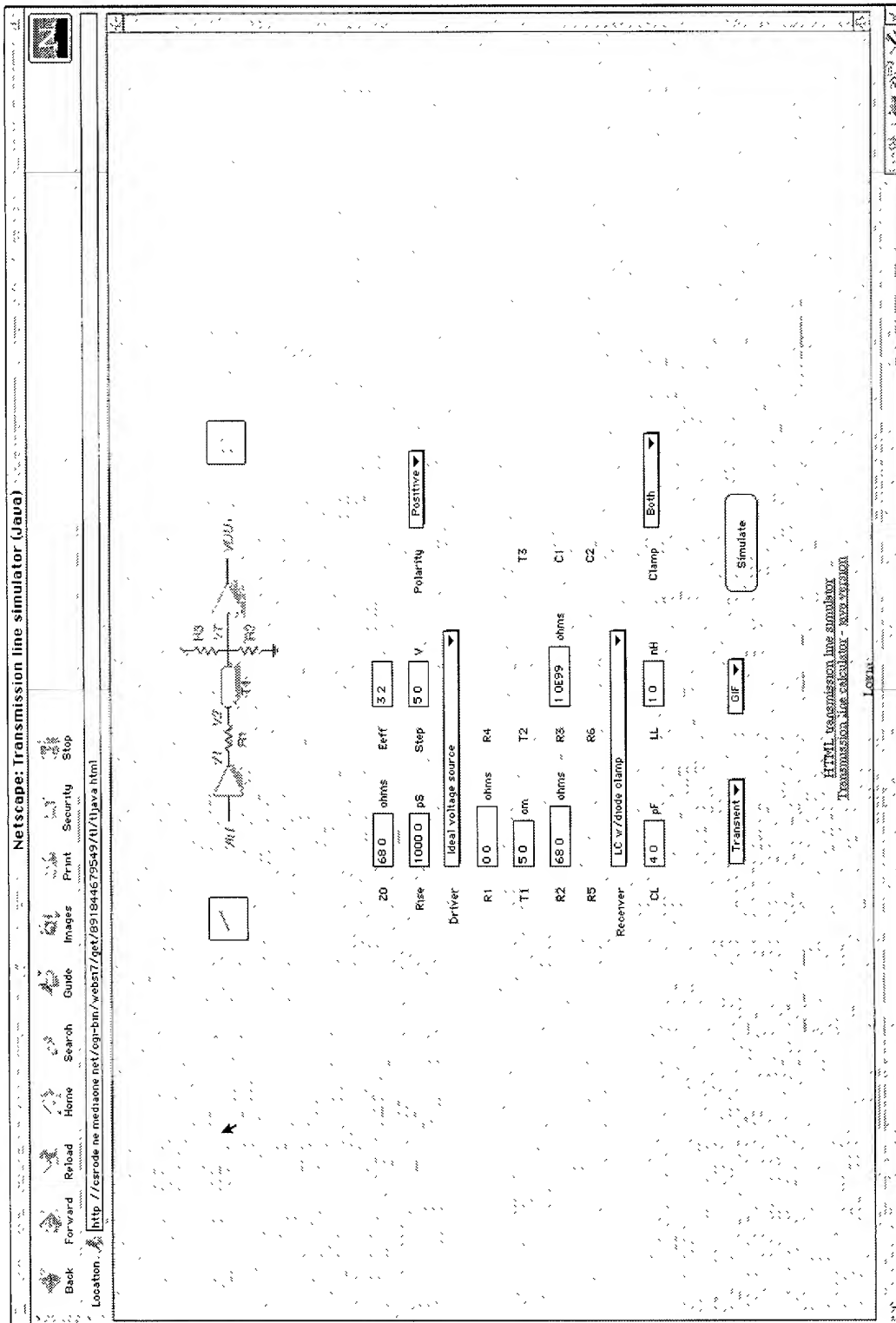


Fig. 4L

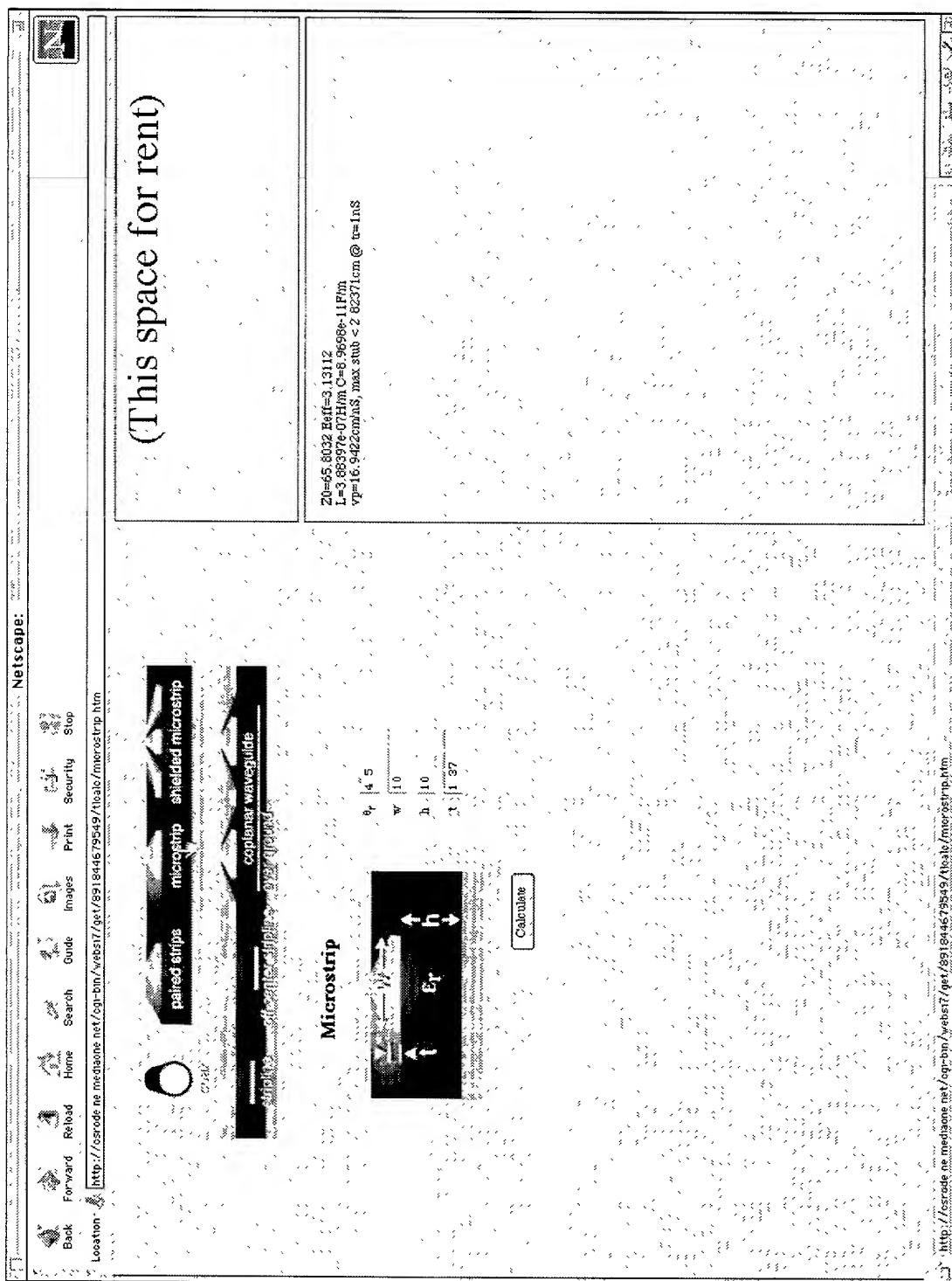


Fig. 5A

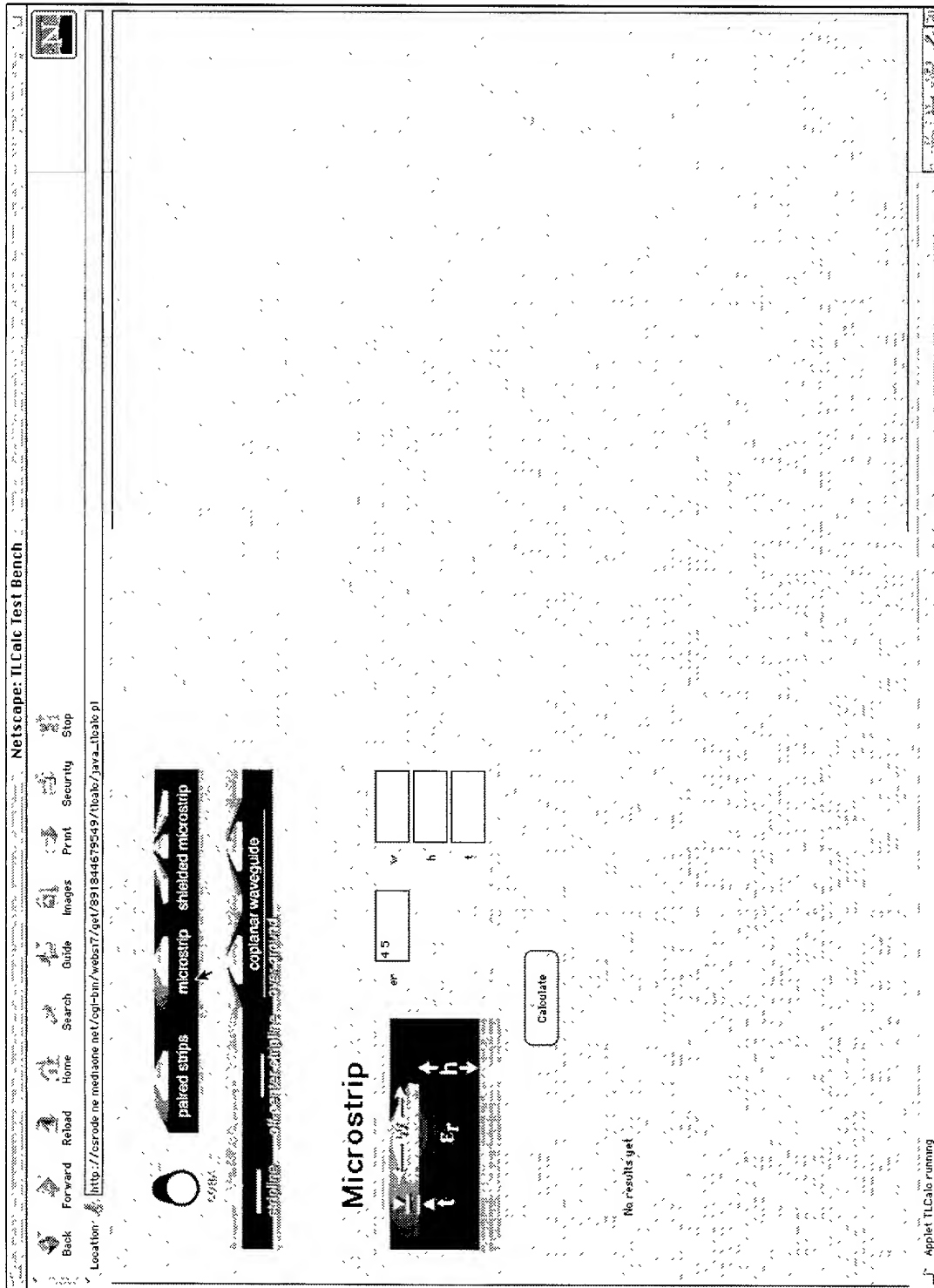


Fig. 5B

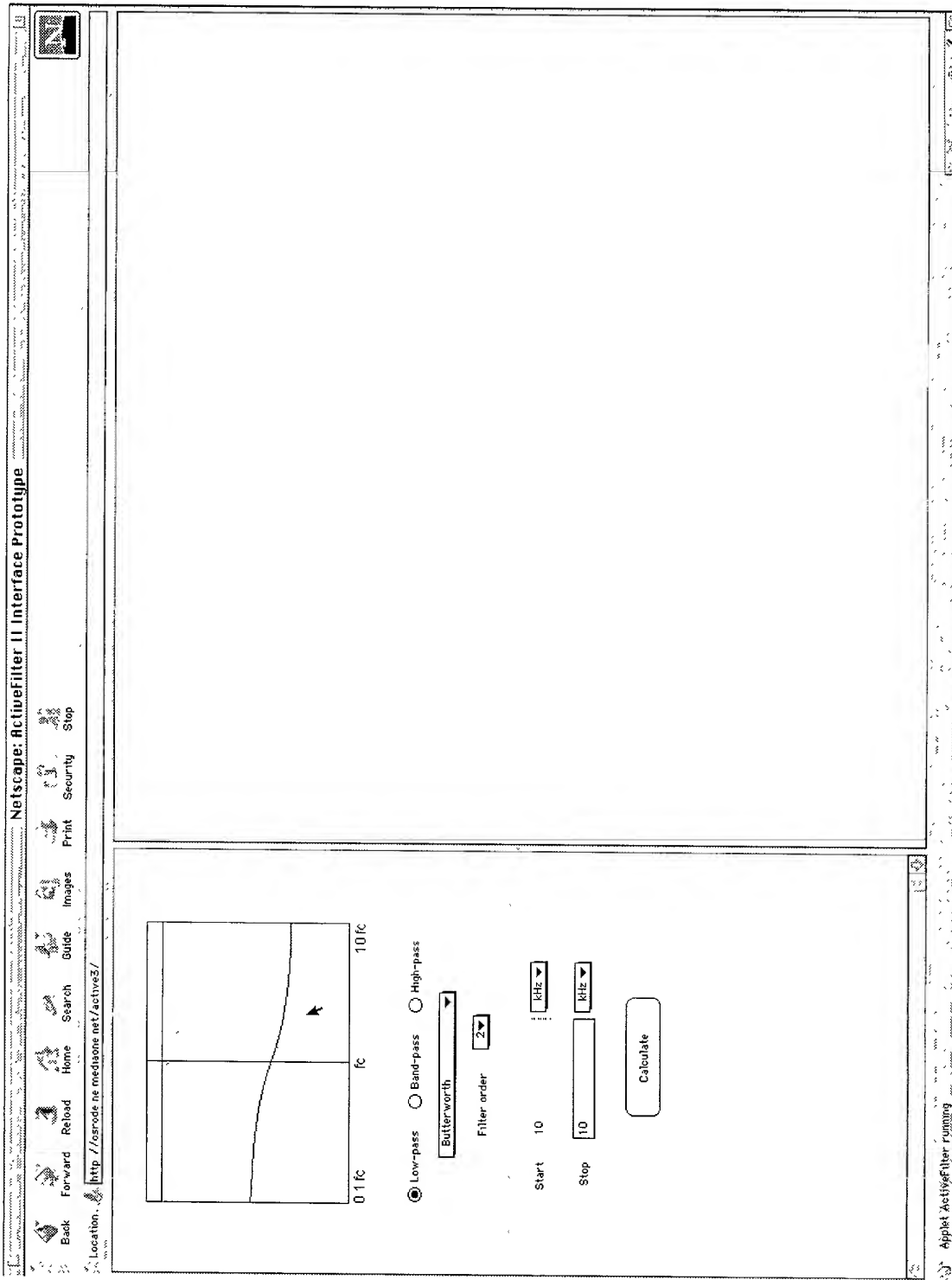


Fig. 6A

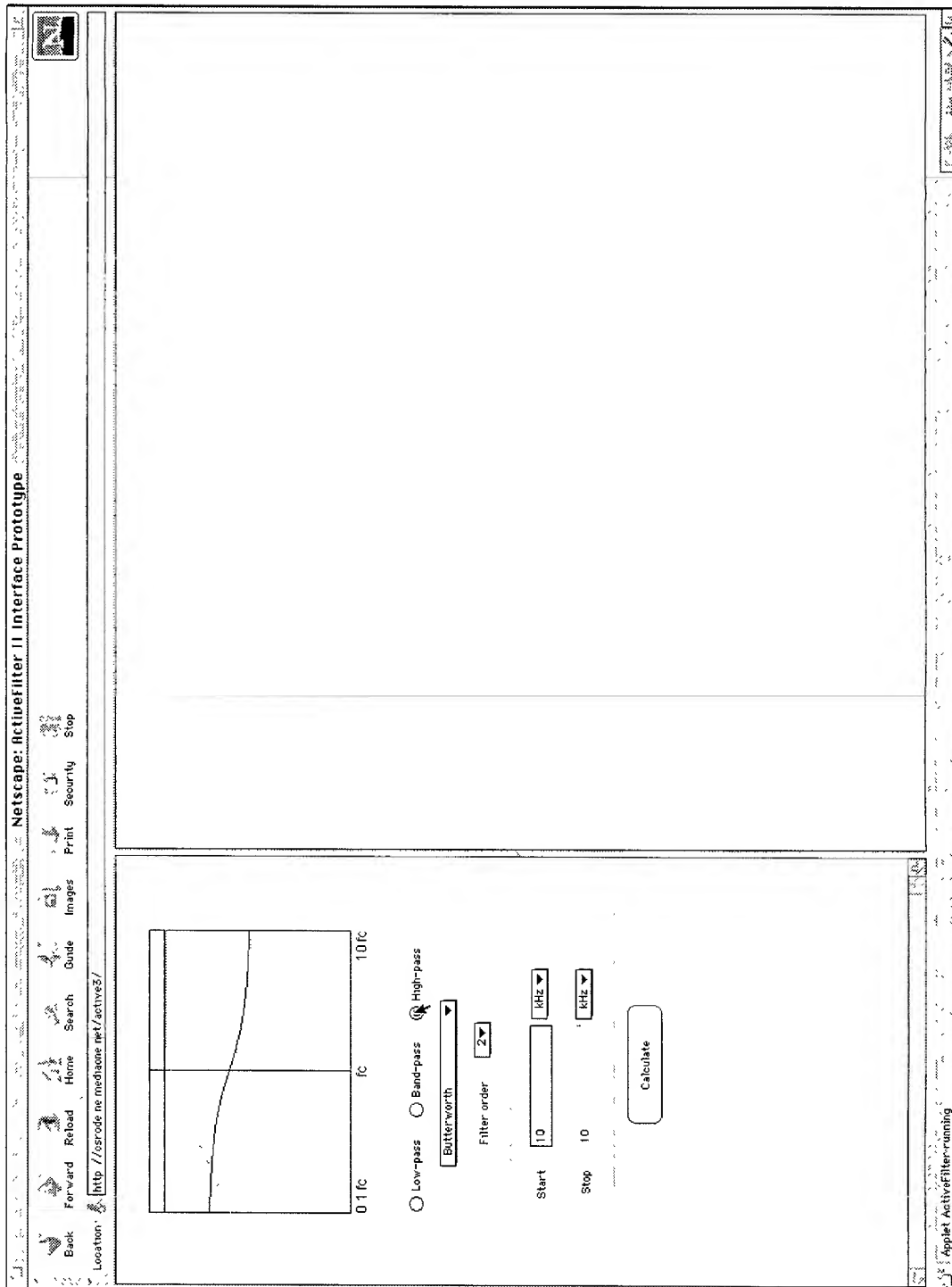


Fig. 6B

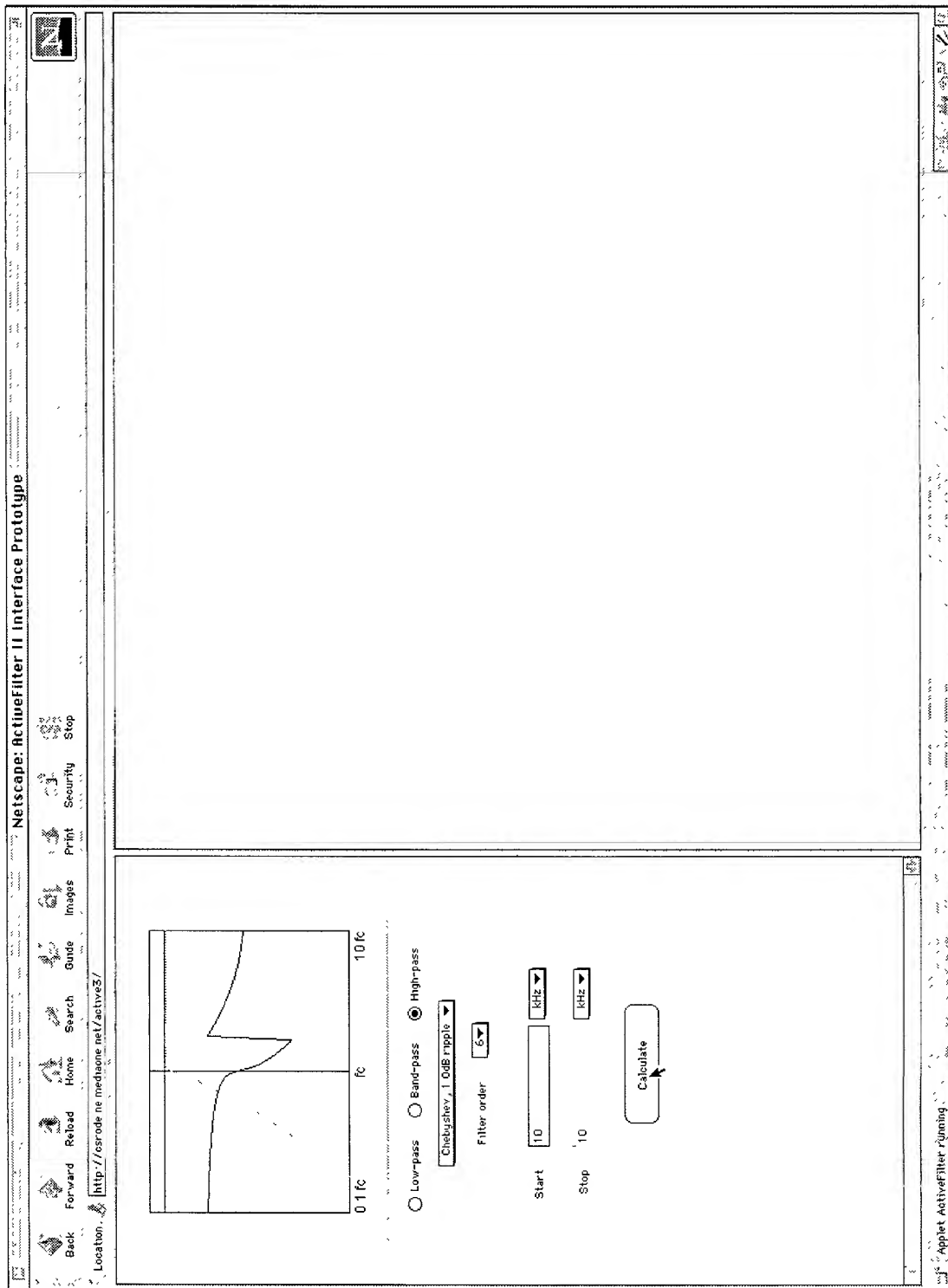


Fig. 6C

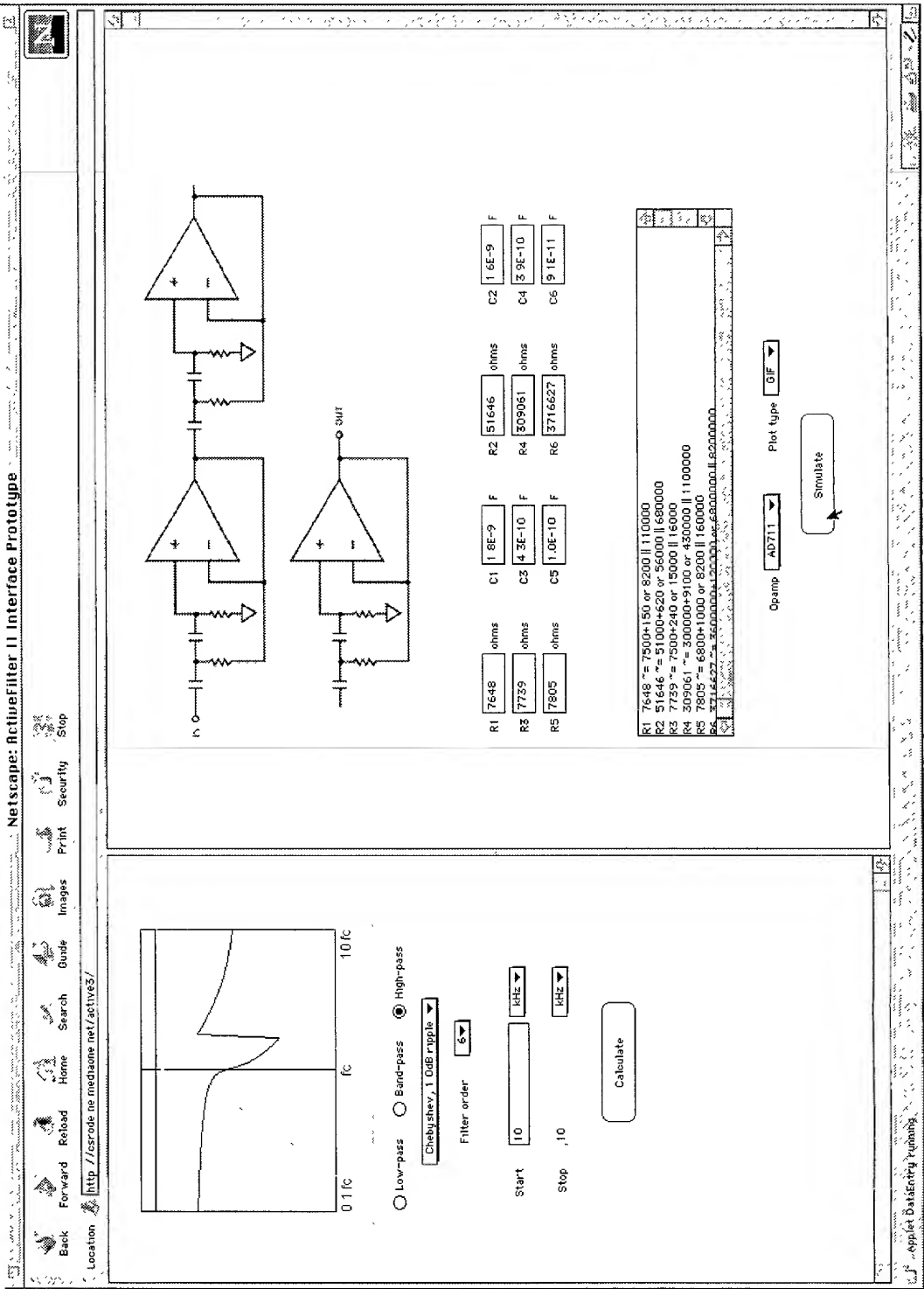


Fig. 6D

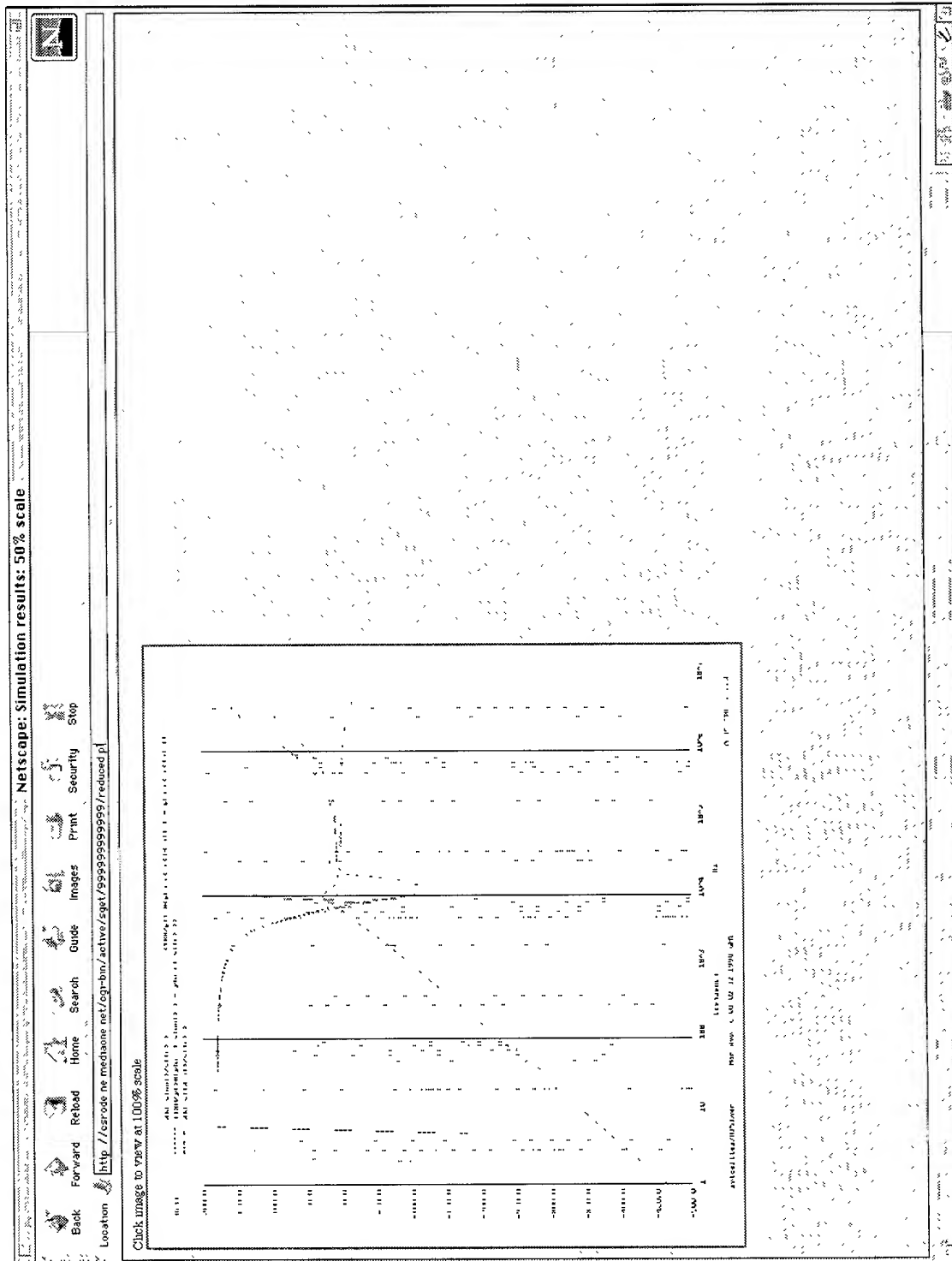


Fig. 6E

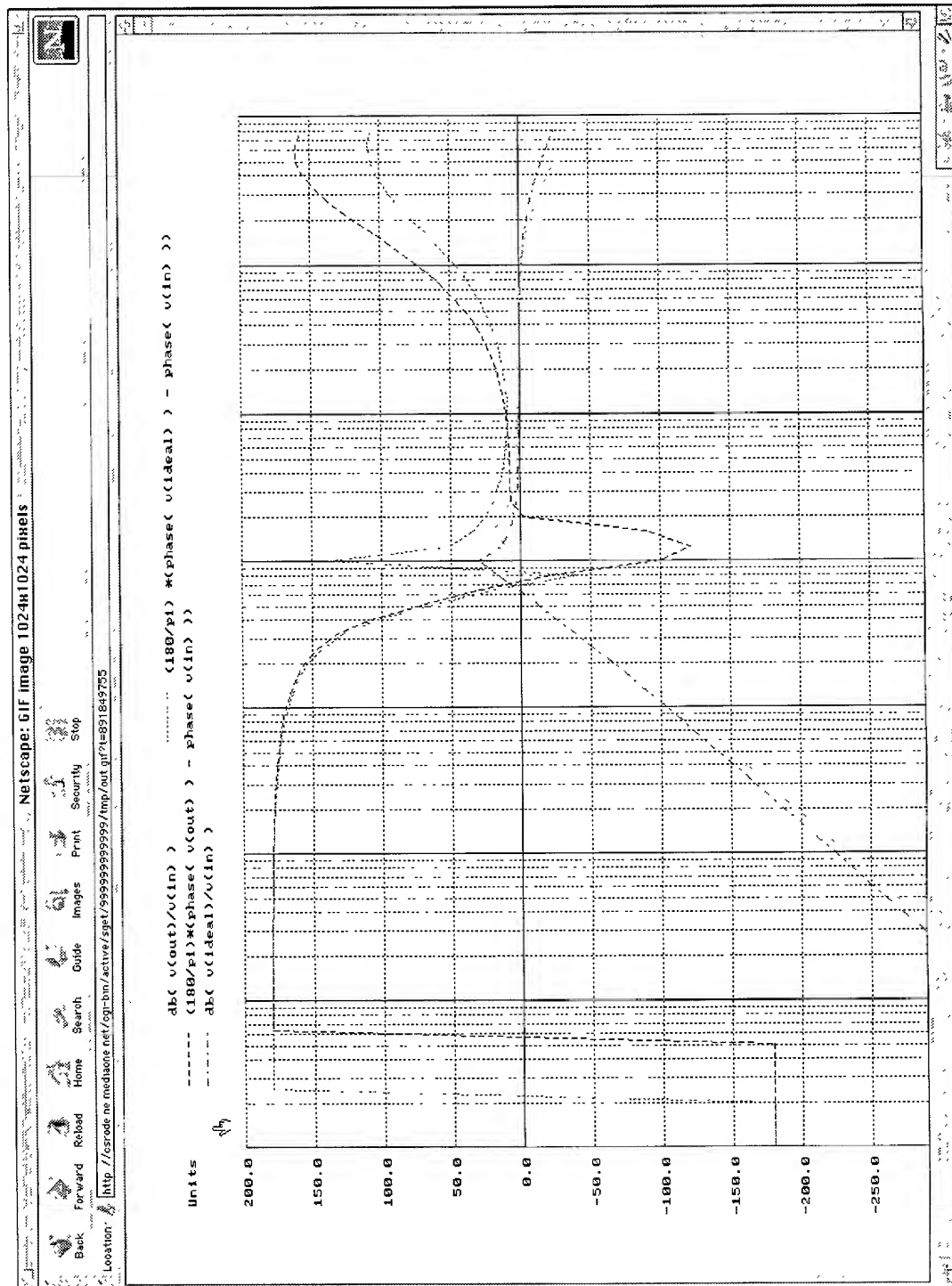


Fig. 6F

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) <input checked="" type="checkbox"/> Declaration Submitted with Initial Filing OR <input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)	Attorney Docket Number	ACI001v1
	First Named Inventor	CHRISTIAN S. RODE
	COMPLETE IF KNOWN	
	Application Number	/
	Filing Date	
	Group Art Unit	
	Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

APPARATUS FOR EVALUATING AND DEMONSTRATING ELECTRONIC CIRCUITS AND COMPONENTS

the specification of which (Title of the Invention)

☒ is attached hereto
OR
☐ was filed on (MM/DD/YYYY) [] as United States Application Number or PCT International Application Number [] and was amended on (MM/DD/YYYY) [] (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below

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[Page 1 of 2]

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
CHRISTIAN STIG	RODE

Inventor's Signature				Date	4/6/99		
Residence: City	WALTHAM	State	MA	Country	USA	Citizenship	USA
Post Office Address	2412 STEARNS HILL RD.						
Post Office Address							
City	WALTHAM	State	MA	ZIP	02451	Country	USA

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